

## NOTES ON AUSTRALIAN EARTHWORMS. PART V.

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Twenty new species, mostly from New South Wales, but with a few from Queensland and South Australia, are described in this paper, the gross anatomy, as in previous papers, being taken into account. They include, besides additions to the genera *Megascolides* (*Notoscolex*), *Perissogaster*, *Digaster*, and *Perichata*, eleven species of *Cryptodrilus*, which, with four already described, make a rather heterogeneous collection of post-clitellian worms [with four couples of setæ to a segment, male pores on XVIII, a single gizzard, and in such cases as they have been visible a single pair of vasa deferentia] among which it is possible to pick out a well-marked group of which *C. mediterræus* may be taken as the type, and a second smaller group of the type of *C. saccharius*; the remainder differ among themselves and from these so much as not at present to permit of their being satisfactorily sorted into sections. As every considerable acquisition of new material throws fresh light on this matter it would be premature just now to attempt to separate any of them as types of new genera. Nevertheless worthy of mention are *C. fastigatus* with three pairs of nephridiopores to a segment, and two pairs of prostates, the two prostatic ducts of each side, however, uniting to form a single genital duct; *C. unicus* with a single median series of spermathecal and male pores—an intermediate condition between this and the rather widely separated pores in forms like *C. Sloanei* being offered in *C. manifestus*; and *C. singularis* with but single pairs of testes, ciliated rosettes, and vesiculæ—a condition which obtains also in *Megascolides* (*Notoscolex*) *Illawarræ*: also *Perichata attenuata* and *P. enormis* of the type of *P. Coxi*, which, in the middle and posterior regions of the body are more or less *perichate*, while for some distance the anterior setigerous segments have four couples of setæ like a *Cryptodrilus*.

Some fifty species of Australian earthworms are now known, but it is very probable that three or four times this number will not entirely exhaust this section of the fauna.

Professor Baldwin Spencer's admirable and superbly illustrated monograph\* dealing with the anatomy of *Megascolides australis*, McCoy, the Giant Earthworm of Gippsland, is a contribution most welcome to the student of earthworms. In it Prof. Spencer points out that my name *Notoscolex* must give way to *Megascolides*, McCoy. Nevertheless, as the characters of *Megascolides* as summed up by Professor McCoy himself were †:—"I am constrained to use a special generic title *Megascolides* for the present form, and make it the type of a distinct genus, which only differs as far as I know from *Lumbricus* in its great size, very much more numerous rings, and the clitellæ formed of three separate short bands, not going round the body, but being confined to the ventral side," an opinion which, so far as I know, Prof. McCoy never subsequently modified—it is obvious that under the circumstances I was quite justified in proposing the genus *Notoscolex*, and in supposing the large Gippsland worms which I examined to be different from *Megascolides australis*.

Professor Spencer's interesting discovery of two separate pairs of vasa deferentia, and of a posterior series of large specialised nephridia will, when other species have been as minutely examined, it may be hoped, lead up to characters of diagnostic importance; e.g., characters, other than those of the clitellum, which will satisfactorily separate forms like *Megascolides* (*Notoscolex*) and *Cryptodrilus* are still desiderata. Nevertheless, as the Tasmanian *Megascolides* has a pair of nephridia in each segment, with a pair of conspicuous nephridiopores, while in *M. Illawarrae* n.sp., there are, as far as I can discover, only single pairs of testes, ciliated rosettes and vesiculæ (and presumably a single pair of vasa, for they are not visible in ordinary dissection), it yet remains to be

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\* Trans. Roy. Soc. of Victoria, Vol. I., pt. i., 1888; Abstract in Trans. and Proc. Roy. Soc. of Vict., XXIV., Pt. ii., p. 164.

† Prodomus of the Zoology of Victoria, 1878, Decade I., p. 23.

seen whether these and other variable characters are as useful for purposes of classification, as they are interesting from the standpoint of morphology.

I have to thank most cordially Messrs. A. G. Hamilton, T. G. Sloane, H. J. Fletcher, and the Rev. T. F. Potts for most valuable help in acquiring material; also Mr. Masters who brought me the first specimens of *C. manifestus* which came to hand. I have also to thank the Trustees of the South Australian Museum, and Professor Tate, F.G.S., of Adelaide, for the opportunity of examining specimens, which, except in one case, were either not new, or on which from paucity of material or the immature condition thereof I am unable to report at present beyond saying that one of Prof. Tate's specimens is certainly a new species, probably of *Megascolides*, but it is without any girdle and I have refrained from its dissection.

MEGASCOLIDES (NOTOSCOLEX) ILLAWARRÆ, n.sp.

Seventeen well-preserved rather contracted spirit specimens from 5.5 (juv.) to 20 cm. long, 4.5 to 7 mm. broad; number of segments from about 240-395. (Ten other specimens are more or less fragmentary).

Colour more or less pale slaty-brown or drab, most noticeable anteriorly and on the dorsal surface. Prostomium broad from side to side, ribbed, its convex anterior surface marked with from 3-5 vertical grooves; not dividing the buccal ring; the latter and usually to a less extent also the second segment ribbed all round right across from the anterior to the posterior margins.

Setæ: the interval between the setæ of the inner couples about half that between the inner couples themselves, and likewise about half that between the two couples of each side; the outer row of setæ of each outer couple in all the specimens irregularly sinuous after about segment xv, some of the setæ of these rows being two or three times as far as others from the corresponding setæ of the inner rows of these couples, the closest of them with an

occasional exception further apart than the setæ of the inner couples but not so far apart as the two couples of each side; the inner couples not visible on segment XVIII, for some distance both in front and behind which segment the setæ of the inner couples stand a little closer to each other than elsewhere.

Clitellum comprising eight or even nine segments, XIV-XXI or XXII, together with usually some portion of XIII slightly modified; complete all round when well developed, but thinner, especially on the last few segments, and of a lighter colour on the ventral surface, the inter-segmental grooves here not being altogether obliterated as they are laterally and dorsally. The ventral surface of XVIII tumid, the swelling extending some way on to the segment immediately in front as well as on to the one behind; a slight depression in the median ventral line divides the swollen surface into two elevations which carry the male pores, these about corresponding with the intervals between the inner couples of setæ. Spermathecal pores two pairs, on or immediately behind the anterior margins of segments VII and IX, a little ventrad of the first row of setæ on each side.

Nephridiopores not visible. Dorsal pores commence after about segment XI.

Alimentary canal presents globular dilatations with vascular walls in segments ix-xvi, especially in the last three or so of these; but there are no calciferous pouches as in *M. Camdenensis*.

Genitalia: one pair of testes and one pair of ciliated rosettes in XI; one pair of vesiculæ seminales in XII; genital ducts short and straight, and immediately behind each of them is a pair of small narrow sacs containing several—two in each sac—delicate curved tapering penial setæ, the longest about 2 mm. long; these are probably protruded through the male pores. Spermathecæ two pairs, the pouches broader and the ducts shorter than in *M. Camdenensis*, each with a rudimentary rosette-like cæcum placed anteriorly on the very short duct near its exit.



The last pair of hearts is in segment XII. The first complete mesentery is in front of the gizzard; the next six are very thick; the next two thinner, but thicker than those which follow.

Nephridial tubules or tufts of tubules numerous, minute; most conspicuous in segments III and IV, though more so in the next few segments than further back; in about the last forty segments, in addition to small tubules, there is a series of larger ones, one on either side of the nerve cord in each segment, doubtless comparable with the large posterior nephridia described by Professor Spencer in *M. australis*.

In other respects agreeing with *M. Camdenensis*.

*Hab.*—Mt. Kembla, Illawarra, N.S.W. (collected by Mr. A. G. Hamilton).

This species comes nearest to *M. Camdenensis*, from which it differs in having fewer segments, the clitellum including a segment or two less, and the outermost row of setæ on each side irregularly sinuous, as well as in the anatomical characters above mentioned; probably also the colour is distinctive, but I have not seen living specimens.

MEGASCOLIDES (?) (NOTOSCOLEX) PYGMÆUS, n.sp.

The complete individuals out of twelve (spirit) specimens from 50-85 mm. long, from 2-4 mm. broad; number of segments from about 145-200.

Colour pallid but with a tinge of brown. Prostomium divides buccal segment only partially (not half).

Setæ of the outer couples further apart than those of the inner ones.

Clitellum: several specimens (juv.) without any sign of it, in the others variously developed, but in none has it quite reached its maximum; comprising segments XIV-XVIII together with some portion of XIX, ventrally in front of XVII not so thick as to obscure

the intersegmental boundaries, but from this backwards enormously swollen and raised, obscuring the division between XVIII-XIX, owing to the whole ventral surface of XVIII to nearly as far dorsad as the third row of setæ on each side becoming tumid and encroaching slightly on XVII and still more on XIX; in the immature specimens without girdles corresponding with the intervals between the setæ of the inner couples swollen into slight papillæ, the setæ themselves apparently wanting, or at least not visible.

Male pores on two slight depressions on the swollen ventral surface of XVIII nearly corresponding with the interval between the setæ of the inner couples but a little closer to the median line, dorsad and slightly behind each of which is in some specimens a second small papilla with what looks like a pore: spermathecal pores two pairs, in worms with girdles on distinct papillæ on or just behind the anterior margins of VIII and IX, opposite but a little dorsad of the first setæ. Of the nature of accessory copulatory structures probably are two intersegmental ridges between XIX and XX, and XX and XXI, reaching on each side to about the second row of setæ, involving about one annulus of each segment, and sometimes presenting a pitted appearance; in one specimen similar ridges between XIII and XIV, and XIV and XV.

Nephridiopores not visible. Dorsal pores commence after about segment XI.

Alimentary canal: one pair of calciferous pouches underlying the intestine and occupying two segments, XII and XIII, constricted, and possibly representing two pairs; large intestine begins in XV; in each of segments V and VI a pair of large tufts of tubules, a smaller pair in VII, possibly salivary organs.

Genitalia: testes and ciliated rosettes two pairs in X and XI; vesiculæ seminales two pairs in XI and XII; prostates in XVIII, with short straight genital ducts. Spermathecae two pairs in VIII and IX, each with a single very rudimentary cæcum.

Last pair hearts in XII. Nephridial tubules numerous, minute.

*Hab.*—Illawarra, N.S.W.

Except that this species is intraclitellian, at present I know of no characters particularly entitling it to be placed in the genus *Megascolides*. It is one of the species which seems to be more or less intermediate in character between this genus and the typical species of *Cryptodrilus*.

For specimens from Mt. Kembla, the first which I saw, I am indebted to Mr. Hamilton; subsequently I found others in the neighbourhood of Kiama.

PERISSOGASTER NEMORALIS, n.sp.

Of five rather contracted spirit specimens three only (one rather bruised) are whole; 10-13 cm. long, 4-6 mm. broad; number of segments, 195-245.

Colour pallid or flesh-coloured. Prostomium appears to divide the buccal ring slightly.

Setæ in eight longitudinal rows, those of the two outer couples further apart (about twice as far) than those of the inner ones.

Clitellum comprising segments XIV-XVIII, sometimes together with a portion of XIII, complete all round except that between XVI and XVII, taking in the posterior annulus of the former and the anterior one of the latter, is a pair of papillæ just dorsal of the inner couples of setæ, or they may become more or less fused so as to form an intersegmental ridge; while the ventral portion of the middle annulus of XVIII is tumid as far outwards on each side as the papillæ just mentioned, the ♂ pores on two little eminences about corresponding with the intervals between the inner couples of setæ; between XVIII and XIX is another pair of papillæ corresponding with the first pair, and more or less fused with a somewhat ridge-like swollen portion of the middle annulus of XIX. Between XIX and XX, and exceptionally also between XX and XXI, is an intersegmental ridge-like swelling reaching outwards on each side to a little beyond the inner couples of setæ.

Spermathecal pores two pairs, between VII and VIII, and VIII and IX, about in line with or a little dorsal of the first setæ. Dorsal pores commence after about segment X.

Probably of the nature of accessory genital structures are ridge-like swellings of the anterior annuli of VIII and IX between the pairs of spermathecal pores.

Alimentary canal: three gizzards in consecutive segments, v-vii; in segments x-xiv are five pairs of calciferous pouches, not quite so completely pinched off as, *e.g.*, in some species of *Cryptodrilus*; perhaps an intermediate condition between this and the globular dilatations in *P. excavata*; the large intestine commences about xvii, and is provided with a typhlosole.

Genitalia: two pairs testes and ciliated rosettes in x and xi; three pairs of vesiculæ seminales in ix, xi, and xii; prostates in xviii, with short thick genital ducts (not so short, however, as in *P. excavata*), behind and close to each of which, and probably communicating with the exterior through the male pores, are two minute sacs containing several thin, slightly curved, and tapering penial setæ, about 1 mm. long without allowing for the curve: the two vasa deferentia join the ducts close to the gland. Spermathecae two pairs in viii and ix, narrow cylindrical pouches with very short ducts, each with a small lobed knob-like cæcum.

Nephridia: a number of small tubules (not so numerous as in *P. excavata*) in each segment; in some of the posterior segments the ventral row on each side larger, a condition which does not seem to obtain in *P. excavata*. A pair of large tufted organs, probably salivary glands, in segment iv.

The last pair of hearts in xiii.

*Hab.*—Gosford, N.S.W. (in brush land).

This species is readily distinguishable from *P. excavata* by the body being much less robust, though comprising as many or even more segments, the pattern and arrangement of the supposed accessory copulatory structures being different, dorsal pores being present throughout after about segment x or xi, whereas in *P. excavata* either they are absent or at most about twenty—and these small or rudimentary—are visible just near the posterior extremity.



## PERISSOGASTER QUEENSLANDICA, n.sp.

Two spirit specimens 15.3 and 15.8 cm. long respectively, 5.8 mm broad; number of segments about 220.

Colour flesh-colour, but with a slight tinge of brown. Prostomium ribbed with from 3.5 vertical grooves; does not divide the buccal ring, though the latter having its anterior half ribbed all round, it may accidentally appear to do so partially.

Setæ of the outer couples further apart (on an average about twice the distance) than those of the inner ones, the outer row of each outer couple slightly sinuous.

Clitellum: no sign of it in either specimen.

Male pores corresponding with the interval between the setæ of the inner couples of segments XVIII—which are not visible on this segment,—or even a little closer to the median line, in one specimen on slight papillæ. Spermathecal pores two pairs, on the anterior margins of VIII and IX, rather close together, and ventrad of the inner rows of setæ. Accessory genital structures not developed.

Nephridiopores not visible. Dorsal pores commence unusually far forward, the first one rudimentary, between segments III and IV, the others very conspicuous, not circular but slit-like.

Alimentary canal: three gizzards in segments V-VII; dilatations of the canal in some of the segments XIV and XV, appear to be the only representatives of calciferous glands.

Genitalia: two pairs of testes and ciliated rosettes in X and XI; three pairs of vesiculæ seminales in XI-XIII; prostates in XVIII, with very short genital ducts as in *P. excavata*; penial setæ were not met with. Spermathecae: two pairs in VIII and IX, each with a rudimentary rosette-like cæcum. [The small size of the vesiculæ, prostates, &c., together with the absence of the girdle, all tend to show the non-breeding condition of the single specimen dissected]. Last pair of hearts in XII.

Nephridia more numerous and minuter than in *P. nemoralis*; in the posterior region, as in that species, the ventral row on each side larger.

*Hab.*—Oxley near Brisbane, Queensland (collected by Mr. T. G. Sloane).

The numerous and conspicuous dorsal pores, together with the situation of the spermathecal pores, even in the absence of accessory copulatory structures, suffice to distinguish this species.

DIGASTER PERRIERI, n.sp.

Twenty-five (spirit) specimens from 3.5 (juv.) to 9 cm. long (the largest specimen in rather a soft condition), 2.5 mm. broad; number of segments from about 110-155.

Prostomium divides buccal ring very slightly.

Clitellum comprises four complete segments, XIV-XVII, complete all round when well developed, but usually the lines of demarcation between the segments not quite effaced on the ventral surface; [a condition which is true also of *D. armifera*, the specimens which furnished my description of this species I now know to have been immature].

This species is allied to *D. armifera*, with which it agrees in its general characters; characteristic points of difference are:—individuals are of smaller size, the body comprising fewer segments; supposed accessory copulatory structures are present, but they are on segments X and XI, or on IX-XI, in one case a rudimentary fourth one on XII, and they consist of ridge-like prominences of the middle annuli extending outwards on each side to about the second row of setæ, and frequently presenting a pitted appearance, whereas in *D. armifera* they are somewhat rectangular areas extending antero-posteriorly right or nearly across the segments, and outwards as far as or a little beyond the first rows of setæ, and they occur on segments XI and XII, in one case though a rudimentary additional one on X: in both species the ventral portion of segments XVII-XIX is more or less altered, presenting

three parallel modified surfaces, but with the important difference that in *D. armifera* each of these is the ventral surface of one, the three segments with the tri-annulate subdivision effaced, these remaining independent of one another ; while in *D. Perrieri* the middle one is the middle annulus of XVIII, the other two being intersegmental, taking in one annulus of each of the two segments between which they occur : the two pairs of vesiculæ seminales are in consecutive segments XI and XII : the penial setæ are of a different shape, the tips slightly bent inwards, but not cleft, below which for a short distance they are minutely serrate, but not swollen.

*Hab.*—Springwood, Blue Mts., N.S.W.

*D. lumbricoides*, Perr., has a girdle of three segments, XIV-XVI, and the dorsal pores commence after segment IV (*vide* figs. 64 and 65, and the explanation of them, in Perrier's monograph, *Nouv. Arch. du Mus.*, Paris, VIII, 1872, p. 197) ; moreover, he says of it that the disposition of the setæ is that of true *Lombries*, and (*l.c.* p. 145) "point d'appareil copulateur." Both *D. armifera* and *D. Perrieri* have at least segment XVII, [and in some recently obtained fine specimens of the former in addition half or two-thirds of XIII and about the anterior annulus of XVIII except ventrally] included in the clitellum ; the dorsal pores commence after about segment X or XI ; the setæ of the outer couples are further apart than those of the inner ones ; and both have penial setæ.

This variation in species of the same genus, in characters which at the commencement of one's investigations when dealing with a single or only a few species, one is apt to regard as of more than specific importance, is exemplified in the case of other Australian genera.

Perrier (in the explanation of fig. 64, *l.c.* p. 197) says that in *P. lumbricoides* the two male pores are preceded and succeeded by a pair of papillæ, as in the case of some species of *Perichaeta*. In *D. Perrieri*, especially in worms without girdles, it is evident that the three modified surfaces above-mentioned consist of three pairs

of papillæ, those of each pair corresponding with, but extending a little way on each side of the inner couples of setæ, and by fusion with the modified intermediate portion giving rise to ridges, in worms with girdles the middle one the most conspicuous, the papillæ carrying the male pores relatively more developed. In *D. armifera* there are no papillæ on xvii and xix, but the ventral surface of these segments is raised for a space extending outwards on each side about as far or a little beyond the first row of setæ, whereas on xviii the whole ventral surface is modified to a little dorsad of the inner couples, for a little distance on each side of which the surface is raised into an eminence which carries the male pores [and what appear to be two pairs of accessory pores, which appear to be wanting in *D. Perrieri*]; in worms with girdles these eminences are large and bulge a little fore and aft, while the modification on xvii is absorbed in, or more or less obscured by, the girdle.

CRYPTODRILUS MUDGEANUS, n.sp.

Five rather contracted spirit specimens from 43.58 mm. long, 5.5.5 mm. broad; number of segments from about 128-145.

Colour when alive probably pallid or flesh-coloured. Prostomium only partially divides the buccal ring.

Setæ of the outer couples further apart (about twice the distance) than those of the inner couples, but quite as far as the two couples of each side: the outermost row on each side in about the anterior half of the body, with an occasional seta out of place, straight; in the rest of the body in all the specimens these rows are irregularly sinuous, some of the setæ being more than twice as far from the corresponding setæ of the third row as others, but not alternating regularly; quite posteriorly the third row also may become irregular.

Clitellum comprising four complete segments, xiv-xvii, together with more or less of xiii (in one of the specimens the whole of xiii may be said to be included, though on the ventral surface the



groove between XIII and XIV is not quite effaced, while just the anterior margin of XVIII is modified), complete all round except for a dumb-bell-shaped genital papilla on the hinder portion of it situated between XVI and XVII but mostly on the latter, consisting of two small elliptical depressions with tumid margins corresponding with the intervals between the setæ of the inner couples but extending each way a little beyond them, connected by a sort of ridge, the intervening ventral portion between the depressions, except the posterior annulus of XVII, becoming tumid. The ventral surface of XVIII forms a shallow depression with raised or tumid margins (or it may be more or less dumb-bell-shaped like that which precedes it), extending outwards on each side nearly to the second row of setæ, on which are situated the male pores just dorsad of the first row of setæ. In three of the specimens between XXI and XXII and occupying the posterior annulus of the former, and the anterior and middle ones of the latter, is an elliptical elevation, its central portion depressed but not extending outwards on each side as far as the first seta; a fourth has an additional and similar one between XXII and XXIII; while the fifth has them between XX and XXI, and XXI and XXII. Oviduct pores on XIV, rather far apart, in front and just ventrad of the inner rows of setæ, usually situated towards the ends of a shallow transverse slit-like depression; spermathecal pores two pairs, on the anterior margins of VIII and IX, about opposite the first setæ.

First dorsal pore after about XI. Nephridiopores invisible.

Alimentary canal: gizzard in segment V; in X to XIII four pairs of calciferous pouches, kidney-shaped and stalked, and overlying the intestine as in *C. saccarius*, not underlying it as in Beddard's species, and in *C. canaliculatus*; the large intestine commences in XVI.

Genitalia; two pairs testes and ciliated rosettes in X and XI; two pairs vesiculæ seminales in XI and XII; prostates in XVII-XXII or XXIII, the genital ducts long and coiled (the vasa deferentia not visible). Spermathecae two pairs, in VIII and IX, the stalk (duct)

fairly long, with a single rudimentary pear-shaped cæcum close to the exit.

Corresponding with the genital papillæ are distinct internal white elevations, a pair in front of the genital ducts, the others median, underlying the nerve cord. No penial setæ met with.

Last pair of hearts in XIII.

Nephridia : numerous minute tufts of tubules, more conspicuous in the anterior region as far back as about segment XVII ; no large specialised nephridia in the posterior region as in *Megascolides*.

*Hab.*—Cullenbone, near Mudgee, N.S.W. ; from the flats bordering the Cudgegong River (collected by Mr. A. G. Hamilton)

This species is allied to *C. saccarius*, but is easily distinguishable by (1) the presence of genital papillæ on the last clitellar segment, the presence of which interferes with the completeness of the girdle on this segment, (2) the presence of four instead of five pairs of calciferous pouches, (3) the cæca of the spermathecae being distinctly pear-shaped not rosette-like knobs, (4) while intersegmental tumid areas such as are usually present on the ventral surface between some of the pre-clitellar segments in *C. saccarius*, are not represented in any of the specimens.

#### CRYPTODRILUS CANALICULATUS, n.sp.

Twelve spirit specimens (not well preserved and much extended) from 12.5-25 cm. long, 3.5-5 mm. broad ; number of segments from about 250-265.

Buccal ring bi-annulate superiorly, not divided by the prostomium, though being ribbed all round it sometimes appears as if it were completely or half divided by the prostomium. Body faintly but distinctly canaliculate throughout in the median dorsal line.

Clitellum comprising four complete segments, XIV-XVII, complete all round, in addition the posterior annulus of XIII and the anterior one of XVIII may be modified, but are not properly included.

Setæ of the outer couples widely separated as in *C. mediterræus*.

On the anterior annulus of XVIII, on the middle and posterior annuli of the same segment, and on the anterior one of XIX is a pair of papillæ corresponding with the intervals between the setæ of the inner couples; the second pair of these apparently carry the male pores, but they are not at all conspicuous; ventrad of each papilla of the second pair is in some specimens a small papilla. Oviduct and spermathecal pores as in *C. mediterræus*, but the former in a groove-like depression. In none of the specimens is the ventral surface of some of segments VI-IX modified as in *C. mediterræus*.

Dorsal pores commence between VIII and IX.

Nephridiopores as in *C. mediterræus*, the first three or four pairs opposite the fourth setæ, then for two or three segments changing to the level of the third setæ, then alternating between these two for some distance, and finally between the fourth and second; on a given segment the two pores are not always at the same level on both sides of the body.

Alimentary canal: gizzard in v; four pairs of calciferous pouches in x-XIII, as in *C. mediterræus*, lying below and at the sides of the canal; large intestine commences in XVI.

Genitalia: two pairs of ciliated rosettes and testes in x and XI; two pairs of vesiculæ seminales in IX and XII; proscates in XVIII-XIX. Ovaries and oviducts as usual; spermathecæ three pairs, in VII-IX, each with usually two short cæca, one on each side and in front of the duct near its exit (nearer than in *C. mediterræus*), but either of these may be slightly bifid or even trifid just at the tip, or completely sub-divided into two or three, or in one case there was but a single broad flat cæcum 5- or 6-lobed just at the tip.

Nephridia as in *C. mediterræus*, that is to say, a pair of convoluted tubules in each segment after the first one, those of alternate segments opening to the exterior opposite the setæ of the fourth or dorsal rows communicate with thin delicate vesicles just before opening to the exterior.

I have no doubt this is also the case in *C. mediterræus*, but in the specimens of that species dissected by me, I was unable to see the connection.

*Hab.*—Forbes, N.S.W. ; from the banks of the Lachlan River (collected by Mr. H. J. Fletcher).

This species is allied to *C. mediterræus*, but of the latter individuals have the body less robust and with fewer segments, are without the dorsal grooving, while the characters of the vesiculæ and spermathecæ are noticeably different.

#### CRYPTODRILUS SLOANEI, n.sp.

Four moderately contracted spirit specimens 52-71 mm. long, 5 mm. broad ; number of segments 135-150 : a fifth doubtful specimen (juv.) 35 × 3 mm., number of segments 180.

Colour pallid (the specimens somewhat bleached perhaps). Prostomium divides the buccal ring almost completely.

Clitellum not developed or indicated in any way in any of the specimens.

Male pores on conspicuous papillæ on XVIII, the pores opposite the second setæ, the papillæ extending some little way on each side. Three pairs of spermathecal pores opposite the second setæ.

Alimentary canal : three pairs calciferous pouches in XI-XIII more or less underlying the canal.

Genitalia : vesiculæ seminales in IX and XII. Spermathecæ three pairs, each of them with two cæca.

Last pair of hearts in XIII.

This species is allied to *C. mediterræus* and *C. canaliculatus*. From the former it differs (1) in the prostomium dividing the buccal ring more or less completely, (2) in having the vesiculæ seminales in IX and XII, and not in consecutive segments, and (3) in the spermathecæ having each two cæca. From the latter it differs in the body having fewer segments, and not being canaliculate, and—as far as I know at present—in the absence of anything like accessory genital papillæ. In all three



species the male and spermathecal pores are remarkably far apart—in line with the second setæ—the first and second rows of setæ themselves not standing so close together as usual; the setæ of the outer couples very far apart so that the outer row of each is quite dorsal in position.

*Hab.*—Coonabarabran, N.S.W. (collected by Mr. T. G. Sloane).

CRYPTODRILUS OXLEYENSIS, n.sp.

A complete spirit specimen 70 mm. long, 4 mm. broad; number of segments about 175. Two other specimens more or less incomplete.

Colour light yellowish-brown, darkest anteriorly and superiorly. Prostomium very partially divides buccal ring, both it and the buccal ring marked with a fine linear groove reaching backwards to the anterior margin of segment II or even III, for some distance further back the body sometimes finely and faintly canaliculate in median dorsal line.

Clitellum not developed in any of the specimens; in one of them segments XIV-XVI of a different colour as if indicative of an approaching girdle.

Male pores on small papillæ opposite the second setæ.

Spermathecal pores intersegmental, four pairs, opposite the second setæ commencing between segments V and VI.

Dorsal pores after segments VI or VII.

Alimentary canal: three pairs calciferous pouches in XI-XIII more or less underlying the canal.

Genitalia: vesiculæ seminales in IX and XII: spermathecae four pairs, in VI-IX, each with a distinct single club-shaped cæcum, in the (non-breeding) specimen dissected as long as the pouch itself. Accessory copulatory structures not indicated.

*Hab.*—Oxley, near Brisbane, Queensland (collected by Mr. T. G. Sloane).

Like the preceding one this is another species belonging to the group of which *C. mediterræus* is the type. The grooving of the prostomium and first two segments, the additional pair of spermathecal pores, as well as its general appearance are among the external characters which serve to distinguish it.

CRYPTODRILUS MANIFESTUS, n.sp.

Seven rather contracted spirit specimens from 5.7 cm. long, 4.5-7 mm. broad ; number of segments about 150-190.

Colour pallid or flesh-coloured. Prostomium divides the buccal ring completely. Segments usually more or less completely triannulate, frequently the anterior annular groove the more distinct; segments widest antero-posteriorly and most conspicuous in front of the girdle especially from segments IV or V to IX-XI.

Setæ in eight longitudinal rows of which on each side two are ventral, one lateral and one dorsal ; the setæ of the outer couples further apart than those of the inner ones, and nearly as far as the two couples of each side. On segments XIII-XVII the setæ of the second row on each side stand successively a trifle closer to the corresponding setæ of the first row ; on XVIII the setæ of the inner couples not visible ; from XIX to XXII or thereabouts the second rows again diverge.

Clitellum comprising four segments, XIV-XVII, complete all round.

Male pores rather close together in correspondence with the approximated spermathecal pores, separated by a slight depression in the median line, on small papillæ on XVIII, just ventrad of the innermost setæ. Oviduct pores in front and just ventrad of the first setæ ; spermathecal pores four pairs, on the anterior margins of segments VI-IX, the pores of each pair on either side of the median line remarkably close together. On XVII, XIX, and on the next three or four segments there are usually accessory copulatory structures—papillæ or depressions corresponding with the intervals between the setæ of the inner couples, those of some of the anterior pairs connected by a transverse depression.

Gen. dorsal pore after segment VIII, but less distinct than those pairs follow. Nephridiopores: one pair to a segment, the first IX<sup>2</sup> on the anterior margin of segment II opposite the fourth seta on each side; the next three pairs opposite the third setæ; the next pair opposite the second or the fourth setæ, after which they oscillate regularly between these two; slight individual variations are common, *e.g.*, in some specimens the two nephridiopores on segment VI correspond with the second setæ, while in two others one pore corresponds with the fourth, the other with the second, but on opposite sides of the body in the two specimens, and this arrangement may persist for a few segments or continue throughout.

Alimentary canal: the gizzard in segment V; in X-XIII four pairs of large calciferous pouches communicating with the canal by rather long ducts, each pair of ducts opening close together but on the floor of the canal; large intestine commencing in XVI.

Genitalia: testes and ciliated rosettes two pairs in X and XI; vesiculæ seminales two pairs in IX and XII; the genital ducts come off from the anterior extremities of the long narrow prostates, the hinder portions of which are bent sharply inwards and then forwards—the bends enclosing the genital ducts—sometimes reaching as far forward as segment XIV, or else compacted into a mass by being bent transversely first to one side and then to the other. Ovaries and oviducts as usual; spermathecae four pairs in segments VI-IX, each with a single club-shaped caecum lying in front.

The last pair of hearts in XII, this and the two preceding pairs very large.

Nephridia: two alternating series of convoluted tubules corresponding with the nephridiopores, a pair in each segment after the first, a vesicular portion close to the proximal end of the tubule.

*Hab.*—Waterfall (Mr. Masters), Bulli (Rev. T. F. Potts), National Park, N.S.W.

This species belongs to the group of which *C. mediterræus* is the type, but is readily distinguishable by the presence of four pairs of spermathecal pores, those of each pair unusually close together.

## CRYPTODRILUS (?) UNICUS, n.sp.

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Twenty spirit specimens from 3.3 (juv.) to 9.5 cm. <sup>f</sup> the  
3.6 mm. broad; number of segments 112-150. <sub>ma-</sub>

Colour above purplish or reddish-brown, lighter below. Prostomium divides buccal ring only slightly (about one third). Segments after the first few biannulate, or with one of the annuli again subdivided. Body noticeably depressed in all the specimens, canaliculate throughout dorsally in the median line with a fine impressed line commencing on the prostomium, interrupted at the dorsal pores.

Setæ in eight longitudinal rows; the first from the median line and the second from the first at about equal distances; intervals between the second and third, and third and fourth about equal, and double that between the first and second. The inner couples on segment XVIII not visible.

Clitellum of four complete segments, XIV-XVII, complete all round but not so thick as to obliterate the intersegmental grooves in any of the specimens.

Male pore single, on a papilla on XVIII in the median line.

Oviduct pores two, in front and just dorsad of the innermost setæ on XIV: spermathecal pores five, intersegmental, in a single median series commencing after segment IV.

Nephridiopores: a pair on the anterior margins of the segments except the first one, the first two or three pairs a little dorsad of, the rest opposite, the fourth setæ. Dorsal pores commence after segment V.

Alimentary canal: gizzard in V or VI; the portions of the intestine in segments IX or X to XII more or less dilated; in XIII-XV there are three pairs of diverticula, the middle pair largest, those of each pair reaching almost from the median dorsal to nearly the median ventral line of the canal, incompletely pinched off, not communicating with it by a duct; the sacculated large intestine commencing about XVII.



Genitalia : vesiculæ seminales four pairs, in IX-XII, the first two pairs adherent to the anterior faces of the mesenteries between IX and X, and X and XI; the second and third pairs to the posterior faces of those between X and XI, and XI and XII; true testes and ciliated rosettes two pairs, in X and XI; prostates in XVIII, the genital ducts long and nearly straight; the vasa deferentia not visible. Ovaries and oviducts as usual: spermathecæ five pairs of stalked pouches with single stalked cæca, those of each pair opening to the exterior by a common aperture under the nerve cord, but one of each pair rudimentary, and then the pouch and the cæcum about the same length, usually alternately on opposite sides, at other times so consecutively for two or more segments.

Last pair of hearts in XII.

Nephridia : a pair of long much convoluted tubules in each segment except the first.

*Hab.*—Narrabri, Coonabarabran, N.S.W. (collected by Mr. T. G. Sloane).

CRYPTODRILUS FASTIGATUS, n.sp.

Five spirit specimens 63-89 mm. long, 3-4 mm. broad; number of segments from about 100-140.

Colour above reddish or purplish tinged with brown, or iridescent purplish, lighter below. Prostomium completely divides the buccal ring. From a little way behind the girdle backwards the body tapers steadily. Segments faintly or not noticeably tri-annulate.

Setæ of the outer couples much further apart than those of the inner couples—the outermost row on each side dorsally situated—and even than the two couples of each side.

Clitellum comprises four segments XIV-XVII, compact and complete all round.

Genital pores: the whole ventral surface of XVIII is tumid, the modified surface extending outwards on each side as far as the

second seta, posteriorly on to XIX, and anteriorly being confluent with the clitellum ; this presents a transverse furrow or depression reaching outwards on each side to about the first seta, near the extremities of which are the not very conspicuous male pores (the details are slightly different in the two specimens from Burrawang). Oviduct pores rather far apart, in front and just ventrad of the first setæ on XIV ; spermathecal pores two pairs, between VII and VIII, and VIII and IX, opposite the first setæ.

Nephridiopores conspicuous, three pairs to a segment after the first one, on the anterior margins of the segments, or even a little way back, opposite or a little dorsad of the first, third, and fourth setæ on each side.

Dorsal pores commence between segments IV and V, but the first one smaller and less conspicuous.

Alimentary canal : gizzard in V, a white glandular mass overlying both it and the posterior part of the pharynx ; in segments X-XVI the alimentary canal presents dilatations in some cases looking like rudimentary pouches ; the large intestine begins in segment XVIII.

Genitalia: two pairs testes and ciliated rosettes in X and XI ; two pairs of racemose vesiculæ seminales in XI and XII (in one specimen three additional similar but smaller bodies, one in XIII, and a pair in XIV) ; prostates two pairs, in XVIII and XIX-XXI, the second pair immediately behind and contiguous to the first, the two on each side at first sight looking like a single mass ; on lifting them however it is at once seen that they are separate, each of them having its own duct, but that the two prostatic ducts of each side join to form a single genital duct which soon increases in diameter, and is bent on itself ; a single vas deferens on each side joining the genital ducts at about the junction of the prostatic ducts. Ovaries and oviducts as usual ; spermathecae two pairs in VIII and IX, pouches with distinct thick ducts, from each of which come off two short club-shaped cæca, one on either side.

The last pair of hearts in XII (in one specimen but in XIII in another).

Nephridia: three pairs of small convoluted tubules in each segment after the first, in three straight rows on either side.

*Hab.*—Burrawang, and Illawarra, N.S.W.

This is a very distinct new species, differing from any Australian species yet described in having two pairs of prostates; nevertheless as there is but a single pair of male pores I propose to retain it in the genus *Cryptodrilus*, at any rate for the present.

#### CRYPTODRILUS TENUIS, n.sp.

Three specimens and an anterior fragment (not in good condition), about 90 mm. long by 4 mm. broad, the body tapering towards posterior extremity; number of segments about 190.

Colour pallid (probably bleached, but even allowing for this lighter than in *C. fastigatus*). Prostomium completely divides buccal ring.

Setæ of the two outer couples further apart than those of the inner, the outermost row dorsally situated.

Clitellum not developed in any of the specimens.

Male pores on conspicuous papillæ corresponding with the interval between the setæ of the inner couples; two pairs of spermathecal pores opposite the first setæ.

No accessory copulatory structures visible.

Nephridiopores three pairs to a segment after the first one on the anterior margin of the segments opposite the first, between the second and third but nearer the latter, and opposite the fourth setæ respectively on each side.

Dorsal pores (not satisfactorily determined, very inconspicuous if present).

Alimentary canal presents modifications, dilatations but not pairs of pouches, in about segments X or XI-XVI.

Prostates are a pair of long linear bodies coiled and folded into a mass, one extremity giving off the genital duct. Each of the spermathecae, of which there are two pairs, has a single rather rudimentary caecum.

*Hab.*—Braidwood, N.S.W. (sent by Mrs. Caird).

This is a distinct species, though from the few unsatisfactory specimens so far to hand the above description characterises it but imperfectly. It is allied to *C. fastigatus* in some respects, these two species at present standing alone in having three pairs of nephridiopores to a segment, and the prostomium completely dividing the buccal ring. They are readily distinguishable from one another by the difference in (1) colour, (2) the situation of the middle pair of nephridiopores, (3) the characters of the prostates, and (4) the caeca of the spermathecae. The dorsal pores commence further forward in *C. fastigatus*.

CRYPTODRILUS MEDIOCRIS, n.sp.

Ten (spirit) specimens are from 32-65 mm. long, and 2-3.5 mm. broad; number of segments from about 114-125.

Colour: body pallid but tinged with brown especially just anteriorly. Prostomium does not divide the buccal ring at all, but looks like a forward prolongation of it; the second segment not so distinctly separated from the first one as usual.

Setae in eight longitudinal rows, those of the outer couples further apart.

Clitellum comprising four complete segments, XIV-XVII, together with as much as half or two-thirds of XIII; complete all round, but the divisions between the segments on the ventral surface not entirely effaced.

Male pores not conspicuous, on XVIII, about in line with or just dorsad of the first setae, near the posterior edge of the pits with tumid margins usually present on this segment. Oviduct pores relatively close together on XIV; spermathecal pores two pairs, on

the anterior margins of VIII and IX, opposite the setæ of the innermost rows. Accessory (supposed) structures comprise (1) between x and XI a pair of oval sucker-like depressions with raised rims involving the posterior annulus of IX and the anterior one of x, their inner margins sometimes confluent in the median line, extending outwards a little beyond the second setæ; a similar pair between XVI and XVII; and two similar but smaller pairs between XIX and XX, and XX and XXI, but sometimes only one but either of these developed; in addition sometimes there are indications of another pair between XV and XVI sometimes on one side and sometimes on the other: the first and second pairs of the above-mentioned are very constant, and are visible in young worms and these without girdles; the others are usually only noticeable in breeding worms and in these there is considerable variation in detail of pattern and amount of tumidity, so that sometimes they are depressions with raised and tumid rims, or the central portion of the depression may be raised, or they may become papillæ. In addition a pair on XVII (usually obscured by girdle if developed) or on XVIII.

Nephridiopores three pairs to a segment except the first few, on the anterior margins of the segments opposite the first (or exceptionally on one side of the body opposite the second), third, and fourth setæ, in the last case first visible on segment III; the other two pairs in my specimens first visible on VI or VII.

Dorsal pores commence after about segment XI.

Alimentary canal: gizzard in v; dilatations of the alimentary canal in some of the segments from about VIII, especially in XII-XIV, but there are no pairs of pouches; large intestine begins in XVI; a typhlosole appears to be present.

Genitalia: two pairs of vesiculæ seminales in IX and XII; testes and ciliated rosettes in x and XI; prostates incised glands occupying 3 segments; spermathecae two pairs in VIII and IX, each with a distinct but short single cæcum attached to the short duct a little above its exit. Corresponding with the sucker-like depressions there are internally white glandular masses.



The last pair of hearts in XII.

Nephridia : three pairs of delicate tubules to a segment (except a few anterior ones).

*Hab.*—Near Parramatta, N.S.W.

In my description of *Digaster armifera* (P.L.S. N.S.W. (2) Vol. I. p. 948) the specimen referred to as "one very small specimen (34 mm. long) has a very good clitellum which takes in a portion of XII and includes XVII," I now know to belong to *Cryptodrilus mediocris*; a single example, the first met with, was obtained with the specimens of *Digaster*, and was not recognised as generically different; by an error the first and second segments were counted as one.

CRYPTODRILUS ILLAWARRÆ, n.sp.

Of ten (spirit) specimens four complete ones are from 8-10 cm. long, 2-3 mm. broad; number of segments 250-270.

Colour pallid or pale flesh-colour. Prostomium only partially divides the buccal ring (less than half).

Setæ of the two outer couples about twice as far apart as those of the two inner ones, but closer than the two couples of each side; the eight rows straight and regular throughout.

Clitellum comprises four segments, XIV-XVII, compact and complete all round (five of the specimens without girdles).

Male pores on conspicuous papillæ on XVIII about corresponding with the intervals between the setæ of the inner couples but extending both ways a little beyond, the pores themselves would be nearer the position of the outer setæ of the couples if these were visible on XVIII; the ventral portion of the middle annulus of XVIII intermediate between the papillæ usually tumid so as to form a transverse ridge more or less completely connecting them. Oviduct pores on XIV, rather close together, each being nearer to the median line than to the seta dorsad of it; spermathecal pores two pairs, between VII and VIII, and VIII and IX, opposite but just

dorsad of the innermost setæ. Between XVIII and XIX, opposite the intervals between the setæ of the inner couples is a pair of genital papillæ apparently with pores, usually a little closer together than the papillæ which carry the male pores, and like these usually connected by an intermediate transverse ridge; the papillæ present in specimens without girdles.

Nephridiopores not visible. Dorsal pores commence after segment x or XI, the first one usually smaller and more indistinct than the others.

Alimentary canal: gizzard in v; calciferous dilatations (but pairs of pouches not pinched off) in VII-XIV; large intestine straight and sacculated commencing in XVI.

Genitalia: testes and ciliated rosettes two pairs, in x and XI; vesiculæ seminales two pairs in IX and XII; prostates in XVIII-XX, genital ducts straight, vasa deferentia not visible; penial setæ not observed. Spermathecae two pairs of stalked pouches in VIII and IX, each with two club-shaped short cæca, one on either side of and about half way up the stalk or duct.

The last pair of hearts in XII.

Nephridial tufts numerous, larger and more conspicuous in the anterior part of the body, very large in segments v-VII (possibly salivary glands).

*Hab.*—Illawarra, N.S.W.

*Var. a.*

Four (spirit) specimens.

Easily distinguishable from specimens from Illawarra by the presence of an additional pair of intersegmental copulatory papillæ, between XVI and XVII; in other respects, as far as I know at present agreeing with them.

*Hab.*—Springwood, Blue Mts.

CRYPTODRILUS SINGULARIS, n.sp.

Forty rather contracted (spirit) specimens are from 45-130 mm. long, 3-6 or 7 mm. broad; number of segments from about 205-240.

Colour pallid or flesh-coloured, spirit specimens with a tinge of brown. Prostomium rather depressed, dividing the buccal ring slightly.

Buccal ring narrow (from before backwards), the next three or four segments successively longer (from before backwards) and wider and biannulate, VI-IX widest and tri-annulate, after which the segments are shorter (from before backwards).

Setæ in two couples on each side, the first ventral, the second lateral; the setæ of the former less than .5 mm. apart; those of the latter about 1 mm. or a trifle more; the two couples nearly 2 mm. apart.

Clitellum when complete comprising segments XIII-XVII, and in addition in a few specimens the first or the first two annuli of XVIII, or even a little more in the ventral and ventro-lateral region, so as to include the ♂ pores; the whole of XIII not included in some specimens; complete all round except for a large genital papilla on the hinder ventral portion of it.

Male pores on papillæ occupying the two anterior annuli of XVIII, extending a little way on either side of the setæ of the first couple or altogether dorsad of them, their extremities in line with the extremities of the large genital papilla, the pores themselves very inconspicuous, about in line with or a little dorsad of the outer seta of each inner couple; in breeding worms the papillæ usually connected by an intervening tumid ridge. Oviduct pores on XIV, in front and ventrad of the setæ of this segment, flush with the surface, or sometimes opening towards the ends of a transverse shallow slit-like depression: spermathecal pores two pairs, not intersegmental but on small papillæ either on the anterior margin of the middle annuli, or between the first and middle annuli of segments VIII and IX, just in front of and nearly in line with the first seta on each side.

Accessory copulatory structures or genital papillæ of a characteristic pattern are noticeable in all but the very youngest and smallest specimens, even in those in which the girdle is

undeveloped. Between segments XVI and XVII, taking in the last annulus of the former and the first two of the latter, is an elliptical smooth and shining convex papilla or boss with a circumferential raised rim, extending a little dorsad of the first couple of setæ on each side, narrower at the two ends than it is in the middle; in worms with well developed girdles it is very conspicuous and large, and encroaches upon the preceding and succeeding annuli so that the inner couples of setæ of XVI, when visible, are seen to be immediately in front of it, while posteriorly it may take in the last annulus of XVII, slightly pushing the ventral portion of XVIII between the male pores a little out of place; otherwise it is completely surrounded by the glandular epithelium of the clitellum. Two or even three somewhat similar but smaller papillæ or bosses (sometimes however they appear as depressions) not extending beyond the inner couples or even the innermost rows of setæ, may occupy similar positions between XVIII and XIX, XIX and XX, and XX and XXI (that is to say the greater portion—two-thirds— of these intersegmental bosses belongs to the posterior segment of each pair); but any two of them—most commonly the first or third—may be absent or rudimentary: the relations of the papillæ, even before the girdle is developed, variously diversified owing to a tendency of the ventral surface in this region to become modified. Frequently a ventral intersegmental swelling is present between VIII and IX, but without definite pattern.

The first dorsal pore is between segments XI and XII. Nephridiopores not visible.

Alimentary canal: the gizzard has behind it the first complete mesentery — the posterior one of segment v—; calciferous pouches are not present, but from VIII-XIV the intestine presents slight dilatations, after which there is a large almost pear-shaped one occupying two segments—xv and xvi—which immediately attracts one's notice on opening a worm; in xvii the canal narrows again, while the large intestine begins in xviii; this is without any typhlosole of the ordinary character, but just from

about segments XX to L, its floor presents four conspicuous longitudinal ridge-like folds, two on either side of the median line.

Genitalia : one pair of testes and one pair of ciliated rosettes in segment XI ; a single pair of racemose vesiculæ seminales in XII, attached to the posterior face of the mesentery between this and the preceding segment ; the prostates are in XVIII and XIX : two pairs of spermathecae in VIII and IX, pouches with rather short duct, each with a single rather rudimentary club-shaped cæcum placed on the inner side of the duct near its exit.

Internally there are white swellings corresponding with the genital papillæ. The last pair of hearts in segment XII.

Nephridia are minute tubules attached to the coelomic wall at intervals forming about five longitudinal rows on each side of the body.

Mesenteries from the anterior one of VI to the anterior one of XII are thicker than the others.

*Hab.*—Burrawang, N.S.W.

#### PERICHÆTA INDISSIMILIS, n.sp.

Twenty-seven spirit specimens (very successfully killed in an almost fully extended condition) of various stages are from 5-11 cm. long, and 2-3 mm. broad ; number of segments from about 90-110,

Colour purplish-red above, darkest in the anterior region ; paler below.

Prostomium nearly divides (about  $\frac{2}{3}$  or a little more) the buccal ring ; the latter usually grooved from before backwards in the median ventral line.

Setæ at first 20 per segment, increasing about XIII to 24, and still further back to 26-30, or rarely a few more.

Clitellum present in only one specimen and only then partially developed, comprising segments XIV-XVI.



Male pores on two small papillæ corresponding with the interval between the first and second setæ on each side, the pores themselves a little dorsad of first seta; the papillæ frequently connected by an intermediate ridge, while contiguous to and immediately dorsad of each of them is a more or less developed eminence extending outwards to the third or fourth setæ, and from before backwards more or less completely across segment XVIII. Oviduct pores just in front of the ventral interval devoid of setæ on XIV, rather close together; spermathecal pores two pairs [in one case three pairs, and in another four pores on one side and three on the other], between VII and VIII, and VIII and IX [when more in front of these] in line with or just dorsad of the first setæ on each side. Accessory copulatory structures comprise modifications of the ventral surface of segments VII-X, XVII, and XIX-XXIII; on each of VII-X a pair of sub-circular swellings, one just on each side of the median line, extending outwards to the third or fourth setæ, and occupying about the anterior two-thirds of the width (from before backwards) of the segment, a pore-like depression in each, opposite and in front of the interval between the first and second setæ; on the others usually a transverse linear fossa with raised rims in front of the interval devoid of setæ, or simply an eminence, and reaching outwards on each side to about the second setæ, in one case the posterior four being situated in raised quadrilateral areas grooved in the median longitudinal line; in most of the specimens these structures are represented only by ill-defined swollen surfaces, but indications of them in some shape or other are very constant.

Nepридиopores invisible. Dorsal pores commence after segment IV or V.

Alimentary canal: a white glandular mass commencing on the posterior half of the pharynx and extending back to about segment VII, overlying and obscuring the small gizzard in V, is very noticeable; three pairs of calciferous pouches, in X-XII; in most of the specimens dissected the large intestine appeared to begin about XXV, but this was, I think, merely accidental.

Genitalia: two pairs of vesiculæ seminales, in IX and XII. Spermathecae two [three or even four] pairs in segments VIII and IX [and VI and V], with caeca as long as the pouch and its duct together.

In each of segments VII-IX there is a pair of conspicuous tufted organs consisting of a roundish mass of tubules lying in front of the posterior mesentery with a stalk or duct reaching forward to the anterior mesentery a little dorsad of the spermathecal ducts. Attached to the coelomic wall just behind the mesenteries are numerous tubules—probably nephridia.

In other respects this species calls for no special mention.

*Hab.*—The shores of Lake Alexandrina, S.A. (collected together with specimens of *P. exigua* var. *Murrayana* near the water's edge under rotten vegetable matter, by Dr. Stirling in November, 1887. *Coll. Adelaide Museum*).

*Obs.*—This species is apparently closely allied to *P. fecunda*. I cannot find sufficient difference to justify the separation of the two specimens with more than two pairs of spermathecae as a different species, and at present I regard them as individual variations. On the whole I find the number of these organs very constant in the different species.

#### PERICHÆTA ATTENUATA, n.sp.

Six complete somewhat contracted (spirit) specimens are from 60-100 mm. long, and 2-3 mm. broad; number of segments about 180-220. [Four other incomplete but otherwise good specimens also examined].

Colour pallid. Prostomium only slightly divides the buccal ring (less than half). Body slender; segments with fewer annuli than in *P. Coxi*, after the first two or three usually more or less conspicuously tri-annulate, in the posterior region where the setae are most numerous the annulation absent but the ridges carrying the setae very conspicuous.

Setæ on the setigerous segments of about the anterior two-thirds of the body 8 per segment, arranged as in *Cryptodrilus* in four couples, the interval between those of the outer couples greater (nearly twice) than that between those of the inner couples, but less than that between the two couples of each side; then increasing to 12, sometimes only 10 or 11 (6 on one side and 5 on the other) visible; still further back in about the posterior fourth of the body—the last four or five smaller segments excepted—the setæ still more numerous, as many as 28, in this region forming two more or less incomplete half-circles, the ventral break very well marked the innermost longitudinal rows of setæ being straight throughout, about twice the width of an average interval; the dorsal break sometimes quite obliterated, some of the dorsal setæ coming close to the median line; the setæ of the half-circles at varying distances apart, sometimes quite close, sometimes separated by considerable gaps, hence the rows of setæ in this region are most irregular.

Clitellum comprising nearly five segments, XIV-XVII together with nearly the whole of XIII, complete all round except for the ventral surface of XVII occupied by genital papillæ.

Male pores not conspicuous, on papillæ on the two posterior annuli of XVII corresponding with the intervals between the setæ of the inner couples; a pair of similar papillæ in front, on the two posterior annuli of the ventral surface of XVII, in worms with girdles the papillæ larger (usually of both pairs) and swollen, then often taking in the anterior annulus of the segment immediately behind them so as to appear intersegmental, the two papillæ of each side then contiguous or confluent, but more or less separated from those of the opposite side by a depression, the area occupied by the four papillæ and the intervening space circumscribed by a very well-marked raised border or rim, elliptical in outline, its long axis transverse, its anterior and posterior margins well defined just behind the anterior annuli of XVII and XIX, its lateral ones more or less fusing with the bases of the papillæ whose dorsal limits reach to a little dorsad of the inner couples of setæ.

Spermathecal pores two pairs, between segments VII and VIII, and VIII and IX, opposite the first setæ.

Dorsal pores commence after about XII, the first one or two not always distinctly visible.

Nephridiopores not visible.

In having six pairs of calciferous pouches in VIII-XIII, as in other respects, this species agrees with *P. Coxii*. Points of difference are that the two pairs of vesiculæ seminales are in IX and XII, instead of consecutive segments; the spermathecæ are long pyriform pouches each with a single distinct club-shaped cæcum; the prostates are smaller, extending through only about three segments, and the last pair of hearts is in XII.

*Hab.*—Mt. Wilson.

This, and the species next to be described, belong to the same section of the genus as *P. Coxii*, characterized by a marked difference in the number of setæ on the anterior and posterior setigerous segments, caused by a tendency in the former to a reduction in the number; also by the pallid colour of the body, and by the large number of pairs of calciferous pouches. [In *P. Coxii* the setæ are not at all conspicuous on the first few setigerous segments, especially on the first two, *i.e.*, segments II and III; but after re-examining a number of specimens I find that these two segments have usually each 8 setæ—in one specimen on III there were 8 on one side and 6 on the other—after which the next few segments have 12, or here and there, as far back as XIII, 14 or 16; still further back the setæ become more numerous and the setigerous ridges more conspicuous, until posteriorly the number increases to about 30 with many gaps in the half-circles, but occasionally when these are more complete as many as about 50 may be counted; the two innermost (ventral) rows are straight throughout, and are the only regular ones. The body is also much more robust, and the genital papillæ are not inter-segmental but are chiefly on the anterior annuli except when there is more than one on a segment]. The three species are

readily distinguishable from one another, and differ more in appearance than one can easily put into definable characters. Any one having at his disposal only anterior fragments of a few specimens of the two new species, might easily be misled into thinking that he was dealing with species of *Cryptodrilus*.

PERICHÆTA ENORMIS, n.sp.

Nine complete (spirit) specimens, several of them young ones, from 50-87 mm. long, 3.4 mm. broad; number of segments about 200-220. (Four other incomplete but otherwise good specimens also examined).

Agreeing with the foregoing species in most respects, but differing in regard to the number and arrangement both of the setæ and of the genital papillæ, and in the number of the cæca of the spermathecæ; the body is not so slender, and the dorsal pores seem to commence after segment x, the first two or three not always easy to see.

Setæ: the first dozen (occasionally one or two less, frequently a few more) setigerous segments with 8 setæ per segment, in four couples as in *P. attenuata*; then the number increases to 12—rarely 5 on one side of a segment and 4 on the other, or 5 on each side—which number then continues fairly constant; the additional setæ making their appearance between the original second and third rows on each side, or one on either side of each original third row, or here and there one dorsad of the original outermost rows; the two innermost (*i.e.* ventral) rows on each side straight throughout, a median ventral interval devoid of setæ about twice that between the setæ of the first and second rows on each side; for some distance one or two of the other rows and the outermost one fairly straight also, leaving a broad median dorsal interval devoid of setæ; soon more and more of the setæ become shifted dorsad, until in about the posterior half of the body all the rows but the two innermost on each side become more or less sinuously irregular, sometimes alternating irregularly



for some distance, while the dorsal interval devoid of setæ becomes correspondingly obliterated, many of the setæ being almost in the median line; in about the posterior fourth of the body this state of things becomes still more marked, the setæ—of which on some segments as many as 16 may be counted, a few additional ones having appeared—being now situated on conspicuous ridges, giving the body a more *perichaete* appearance, the setæ of the half circles at noticeably irregular distances apart.

Genital papillæ: between each two segments from XV-XXI is a pair of flat-topped genital papillæ with indistinct pores—six pairs when all are developed, but some of them especially the first or the one between XVIII and XIX, or the hindermost may be wanting altogether, or only slightly developed, or only on one side of the body, or the last pair may be between XXI and XXII—opposite and extending outwards a little dorsad of the interval between the first and second setæ on each side, the corresponding papillæ of opposite sides more or less completely connected across the median line, giving rise to what, for want of a better appellation, in my descriptions of other worms I have called 'dumb-bell-shaped.' The male pores are not very conspicuous, on two little papillæ on the pair of genital papillæ between XVII and XVIII, and  $\frac{2}{3}$  of which are on the latter segment, corresponding with the interval between the first and second setæ (not visible on XVIII) on each side but just ventrad of the latter.

The spermathecae are pouches with rather long ducts, each with two short but distinct club-shaped cæca, one on either side of the duct near its exit, just as in *Cryptodrilus Illawarrae*.

*Hab.*—Near Gosford, N.S.W. (in brush land).

PERICHÆTA MACLEAYI, n.sp.

Twelve (spirit) specimens from 55-90 mm. long, 3.5-4.5 mm. broad; number of segments from about 80-90.

Colour above dark purplish-brown especially in front of the girdle, lighter and more reddish at the sides, paler below. Prostomium divides the buccal ring for a little more than half, the latter grooved in the median ventral line.

Setæ at first 20 per segment, just behind the clitellum 24 may sometimes be counted, the number increasing in the posterior region to about 28. The median ventral interval devoid of setæ from 2-3 times the width of an ordinary one between two setæ; the median dorsal interval narrower, nearly twice an ordinary one.

Clitellum comprising segments XIV-XVI together with two-thirds of XIII and of XVII, complete all round except for a little unmodified patch on which are the oviduct pores.

Male pores on papillæ on XVIII, about opposite the second setæ on each side, but being large and slit-like, extending both ways beyond these setæ. Spermathecal pores two pairs, between VII and VIII, and VIII and IX, opposite or a little ventrad of the third setæ. Accessory copulatory structures comprise a pair of genital papillæ on XVII, and a similar pair on XIX, in both cases a little ventrad of the papillæ carrying the male pores, and corresponding with the intervals between the first and second setæ; the papillæ of each of these two pairs frequently connected by an intermediate ridge or swelling—on the anterior annulus of XVII and the posterior one of XIX; hence the six papillæ and their connections come to enclose a basin-shaped depression; sometimes the papillæ have one or two pit-like depressions (apertures?), and occasionally there is a small papilla on XVIII between those carrying the male pores: also a pair of swellings on X, and another on XI, extending a little beyond the first and second setæ on each side, and antero-posteriorly across the segments, best defined in worms with well-developed girdles and then each with a central pore-like depression.

Alimentary canal: only two pairs of calciferous pouches in XI and XII.

In other respects like *P. australis*.

*Hab.*—Sydney (common in the Hon. W. Macleay's garden at Elizabeth Bay).

This species is allied to *P. australis*, but differs in respect of the papillæ on which the male pores are situated not mammillary, in having accessory genital papillæ and ridges on xvii and xix, and swellings on x and xi, in having fewer setæ in the posterior region, and the spermathecal pores more ventrally situated ; individuals also are smaller, the body comprising fewer segments ; while there is a tendency for much both of xiii and xvii to be included in the girdle. I have recently obtained some large and very fine examples of *P. australis* which have the ventral surface of xvii more or less tumid, with a depression opposite and in front of the papillæ carrying the male pores.